FEBRUARY 1948

MARKETING ACTIVITIES

U. S. Department of Agriculture
Production and Marketing Administration
Washington 25, D.C.

IN THIS ISSUE:

Address all inquiries to
The Editor, Marketing Activities
Production and Marketing Admin.
U. S. Department of Agriculture
Washington 25, D. C.

Issued monthly. Vol. 11, No. 2

New Trends in Marketing

By R. W. Hoecker

What happens in 40 million American kitchens profoundly affects our system of marketing and, through marketing, the farmer's production practices and financial returns. What homemakers want, think, and prepare make the trends that men responsible for progress in marketing carefully observe and act on.

A current trend that affects the merchandising of fruits and vegetables is the housewife's concern with the nutritive value of the food her family eats. Nutritive value is largely determined by the freshness of the product or the degree to which the processor has been able to retain its innate freshness. Successful handlers of farm products know how important it is to keep as much of the original value of the product as possible.

Less Work in the Kitchen

Just as important a trend is that women now use their kitchens less for the extensive preparation of food. Some of the duties that the housewife and the domestic help once performed now are being taken over by the marketing agencies.

Together, these trends have caused food handlers to adopt air transportation, encourage improved refrigerated and faster surface transportation, package many of the products, retail fruits and vegetables from refrigerated cases, and quick-freeze perishable agricultural products in order to give the housewife a fresher and tastier commodity. Prepackaged and frozen fruits, vegetables, and meat that have been cleaned and partly or wholly prepared for cooking help the housewife better to enjoy her work in the kitchen. Many of the changes have been at an additional cost per pound of product to the housewife, but not necessarily at an additional cost per unit of nutritive value. Insofar as the time of preparation is shortened and the quality of the food is improved, the housewife usually is willing to pay the additional cost.

Besides recognizing trends, successful distributors recognize that tastes and consuming habits are acquired over a period of time. If the product, as processed by the marketing agency, is of the kind that would cause consumers to change their habits, inertia may be encountered, and the adoption of the new method will probably be slow. The new method of processing may be superior to the old in retention of nutritive value and cost, but consumers often appear to be unreasonable and reluctant to change old habits. Dehydrated foods may be more nutritious and cheaper than poorly handled fresh foods, but housewives are accustomed to buying their carrots as whole carrots and not as shriveled cubes.

An examination of some of the recent marketing developments, with an understanding of basic trends, enables us to appreciate how the new developments will fit into the future marketing pattern.

The extensive preservation of foods by freezing has developed since 1940, although the Eskimos have preserved fish by freezing for years. Preliminary experimentation on freezing and merchandising frozen foods had taken place for 15 to 20 years before the war, but the wartime shortage of tin cans gave extra impetus to the practice.

Foods are frozen in the large commercial freezing plants, in locker plants, and in home freezers. The bulk of the frozen food is processed by commercial handlers who purchase the raw product from the grower, prepare it, package it in consumer-size units, and freeze it. The operators then sell to wholesalers, who, in turn, sell the frozen food to retailers. The frozen food is retailed from low-temperature cabinets.

The primary function of a locker plant is to furnish low-temperature storage for its patrons. Lockers of 6 to 8 cubic feet are leased to patrons, usually on a yearly basis. Patrons store their frozen food in the lockers and have free access to them. Practically all locker plants now have a freezing unit in which the patrons' food may be quickly frozen before being placed in the lockers. As a supplementary service, many locker plants have helpers who will, for an additional charge, prepare meat or produce for freezing.

The home freezer usually consists of two compartments, one that may be reduced in temperature well below 0° F. for quick freezing of the foods and the other compartment held at about 0° F. for storing the frozen food until used by the family.

Frozen Fruits and Vegetables

Frozen fruits and vegetables have several definite advantages over the fresh product. They are easier to buy, require little or no preparation for cooking, keep indefinitely in the freezer compartment of the refrigerator, are quite free of waste, and have uniform quality throughout the year and from store to store. Many products are available in frozen form when the fresh is out of season. Many people consider the taste of most frozen fruits and vegetables superior to that of the so-called fresh product that has been hauled and mauled through the usual marketing channels. The vitmain content is high. Most people, however, apparently prefer the flavor and texture of first-quality fresh fruits and vegetables.

Many frozen products are superior to canned fruits and vegetables in almost every way except ease in preparation and relative cost or price. There is reason to believe that the cost advantage that processors of canned foods have today will gradually diminish as the volume of frozen foods picks up and chain stores feature the products more.

With the advantages. that many frozen fruits and vegetables have, their production probably will materially increase. Frozen foods will replace some of the volume of both fresh and canned consumption besides increasing over-all consumption. But the increase in consumption will take time. Consumers will have to become more familiar with the frozen products; distribution facilities must be expanded and improved; consum-

ers will only gradually replace their obsolete refrigerators with modern ones that have adequate frozen-food storage compartments, and production agencies must learn how to produce a large volume efficiently.

From the standpoint of quality, frozen meats are not superior in essential respects to the product now sold, and the convenience in cooking is not greatly different. From the standpoint of cost, while it seems certain the cost per pound of product sold will be greater for frozen meats than for fresh, this may be partly or entirely offset if allowance is made for the elimination of bone and trim. The extra cost of frozen meats consists largely of the cost of cutting and packaging and of additional refrigeration costs in wholesaling and retailing. To a considerable extent, if not entirely, this may be offset by savings in labor in the retail store, savings in transportation, and better utilization of various waste products.

Frozen meats have certain definite advantages. They can be standardized in weight and quality, so that the consumer who buys a package of branded frozen steak or roast can count on getting just about the same product day in and day out. They are well adapted to self-service retailing. Packers find an incentive to handle frozen meat because it can be given a brand name and advertised. There should also be a tendency to increase over-all consumption and reduce variations in price because freezing permits a more even distribution of meat, the production and marketing of which reflect seasonal influences.

The chief obstacles to the commercial development of frozen meats are: The antagonism of retail butchers whose livelihood would be endangered by centralized cutting operations; the cost of equipping packing plants, branch houses, and retail stores with low-temperature equipment; and the higher price per pound of purchased product (not necessarily per pound of edible product) to consumers, because of the elimination of bones and waste.

In time frozen meats may be expected to overcome most of the obstacles--although rather gradually, perhaps--through the introduction of one frozen specialty item after another, and with smaller packers and self-service stores taking the lead in offering more complete lines of frozen meats.

Frozen Precooked Foods

A recent development is the freezing of precooked foods. To serve these foods it is necessary only to heat them in a controlled oven for a predetermined length of time. Some processors put complete meals on disposable plates so that the meal can be prepared by simply heating the prepared plate. Frozen precooked foods have been most widely accepted by railroads, air lines, and steamship lines. Many apartment-house dwellers, with none too adequate kitchen facilities and little time to use those that they have, find such foods convenient.

For some years the trend has been distinctly away from home processing. Commercial processors can do the work more efficiently and cheaply

than the individual housewife, or even the locker plant. Even when other marketing margins are added to that of the processor, the consumer saves little by doing this sort of work. The superior quality of home-prepared foods has probably been more of a consideration to many than the small monetary savings. As complete lines of frozen foods of excellent quality and at lower prices become available in retail food stores, the locker plant will find increasing difficulty in competing with commercial processors and merchandisers. Many will survive and some will prosper, especially in rural areas, but individual freezing is not likely to become an important factor in over-all food processing.

Packaging of Foods in Consumer-Size Units

Advances in packaging have been rapid. The new knowledge will be evident in many improvements affecting farmers, consumers, and marketing agencies. Packaging in consumer units is of help in low-cost, self-service methods of retailing, lowers spoilage in handling, and makes possible more sanitary conditions than when the food is handled in bulk. Packaging of staple products has become standard procedure, but packaging of highly perishable fresh fruits, vegetables, and meat is still in the experimental stage. The development of suitable transparent films has made the prepackaging of perishable food practical, because through them the buyer can see the food she is purchasing.

The housewife is accustomed to go to modern markets and select the packaged products from the shelves, but when she comes to the produce and meat departments she, or a clerk, has to select and weigh the products she wants. The satisfaction of the housewife varies with the number of other purchasers who have previously handled and selected from the produce displayed in the racks. Produce sold in this way is usually accompanied by a high proportion of waste for the retail store. When the fresh fruit and vegetables are wrapped in transparent films, most of the reasons for the objections are removed. When making her purchases, the housewife is able to obtain a more uniform quality and a more sanitary commodity than previously. Most prepackaged produce and meat have been trimmed and partly prepared for immediate cooking. This partial preparation keeps refuse out of the kitchen and saves housewives' time in preparation.

Fresh fruits and vegetables may be packaged at almost every stage of distribution. Any stage of distribution at which the operation is performed has certain advantages and disadvantages varying from one commodity to another. Packaging in the production area makes possible the preservation of the greatest amount of the food value of the products. It also makes possible the elimination of a great deal of waste that would otherwise be transported and sent through the channels of trade. Growers want to do the packaging in the producing area because they see possibilities in identifying their goods all the way to the table.

Packaging at the terminal has the advantages of a continuous operation throughout the entire year. The terminal operator can also more easily achieve the desired goal of having all of his produce packaged in consumer-size units. Packaging at the terminal also makes possible a

later check on the quality of the produce.

Much remains to be learned as to proper stage for packaging, the kind of materials to use, handling methods to be employed, and the proper way of refrigerating. The quality of packaged goods is of the greatest importance, because when the housewife buys them she expects to find all the contents of uniform quality. When bulk merchandise is displayed, a bad apple may be left in the basket and only good apples purchased. When these apples are sold in a closed package, the housewife pays for all the apples in the package regardless of whether they are all good or not. If after making several purchases she finds too many bad apples in the package, she will discontinue buying them.

Because consumer packaging makes possible the branding of the packages, more care is likely to be given produce in its handling after the brand is put on a consumer package. This in itself will tend to improve greatly the marketing of perishables, because each handler now has little personal interest in the commodity after he has sold it to the next person in the marketing chain. Branded, packaged perishables will encourage the entrance into the wholesaling field of more service wholesalers, whose function is to see that produce is sold according to the best accepted methods (rather than simply to supply the retailers).

Prepackaged fresh meat has many of the advantages of prepackaged frozen meat. It is possible that selling prepackaged fresh meat may cost less than selling prepackaged frozen meat. Many of the difficulties encountered in selling prepackaged frozen meat will also have to be overcome by retailers who sell prepackaged fresh meat. Prepackaged fresh meat has the disadvantage of turning dark when exposed to the light and is more perishable than frozen or uncut fresh meat.

The net cost of handling perishables packaged in consumer-size units, compared with handling them in bulk, must be calculated all the way from the grower to the net quantity available to the housewife for cooking. With savings in transportation, waste, and retail store labor, the additional costs of cleaning and for packaging material will be largely offset by the saving. The housewife is likely to receive a greatly superior product if the prepackaged produce is properly handled from the grower through the marketing chain to the retail store. The net cost of prepackaging should be computed in terms of cost per nutritive unit rather than cost per pound of produce--that is, a pound of prepackaged snap beans when properly handled may be twice as nutritive as a pound of ordinary bulk beans.

New Developments in Transportation and Dehydration

The war has made possible the movement in volume of air freight, many new refrigerator cars of different design, and improved trucks.

The improvements in transportation are in the form of speed and better refrigeration. As refrigeration is improved, the need for greater speed is lessened, and the reverse is also true. The speed of some truck deliveries and of most air-freight deliveries sometimes makes artificial refrigeration unnecessary. When produce is properly refriger-

ated, the rate of deterioration is greatly retarded, and properly refrigerated produce may retain its original quality as well for 2 weeks as unrefrigerated produce does for only a day.

Planeloads of highly perishable fruits and vegetables have been moved from production areas to eastern consumption centers on a daily basis since 1946. This movement has been made possible because of the availability of the large number of surplus war cargo planes and the thousands of trained pilots and mechanics.

Air transportation has made it possible to move many commodities--tropical fruits, for example--that formerly could not be shipped more than 200 or 300 miles from their production centers. Processors will be able more nearly to reach a goal of making produce "pot ready" in the production area when air transport is used than when any other existing method of transportation is used. Lima beans and peas may be shelled and packaged, sweet corn may be husked and packaged, spinach may be washed, selected, packaged, and delivered more successfully by the use of air transportation than by railway or truck.

New Designs for Refrigerator Cars

During the war a large number of refrigerator cars wore out and many of those that remained needed major repairs. The accumulated need for new cars made it more feasible than before the war for the car manufacturers and railroads to adopt new designs for refrigerator cars. New techniques that have already been proved have been incorporated into most of the new designs and, before a substantial number are built, additional improvements will no doubt be incorporated. These improvements make it possible to hold lower and more uniform temperatures at less cost than the units in the old cars. Truck owners are rapidly installing new and improved mechanical units that have certain advantages over the use of ice. Truck schedules and rail schedules are being speeded up in order to give better service to the shipper.

Dehydrated foods, because of their high nutritive value per pound of product, were in much demand during the war by Army officers. A considerable amount of research was done to improve the texture and flavor of the dried foods, but despite the improvements most of them were poor substitutes for the fresh product. Dehydration is simply the preservation of food by the removal of most of the water in the product either by exposure to the sun, in which case the process is called drying, or by exposure to hot air or treatment in a mechanically heated drum, which is known as dehydration. Care must be taken in dehydrating produce to preserve as many of the vitamins as possible, to prevent the processed product from acquiring any off-flavors, and to get a product that can be reconstituted satisfactorily. Generally speaking, some dehydrated products are inferior to fresh, frozen, or canned products in nutritive value and taste. Even though they are equal to the fresh in taste and wholesomeness, their appearance prevents rapid acceptance by housewives. Dehydrated foods on the whole are less costly to process, store, transport, and retail per pound of edible product than are frozen or canned foods.

New developments in marketing will affect differently producers, consumers, and marketing agencies. Seasonal supplies and prices of many fruits and vegetables will be more stable. Not many years ago the housewife was limited in her purchases of fresh fruits and vegetables to those grown within a radius of 10 to 50 miles of her residence. Now she can purchase lettuce every day of the year because lettuce is grown on the west coast the entire year. What has happened to lettuce has also happened to many other fruits and vegetables. As transportation and other marketing techniques improve, the story of lettuce will be repeated more and more often. Formerly, producers of strawberries received relatively low prices because the strawberries had to be sold quickly when they were ripe for immediate consumption or for preserving. Now, with facilities for freezing and good transportation, the producers are not forced to sell all their berries in the local market. Rather, the berries that they cannot sell locally are sold in distant markets or are frozen to be sold in seasons when fresh berries are not available.

Local Producers Stand To Gain

On the whole, local producers have more to lose than gain because of improved marketing methods. Agricultural commodities will be produced in areas of lowest costs, that is, where natural conditions of climate and soil make it cheapest to grow them. Formerly the consumer depended entirely on local production. Now he can get his supplies from other areas if those supplies are cheaper or better. Thus the consumer gains from having a wider choice of good quality merchandise at widely competitive prices.

The gradual shifting of stores to a more completely self-service basis will favor the processors whose merchandise can win recognition among consumers and the trade. Retailers emphasize efficient service, sanitary methods, and the importance of preserving food values. Costs of giving the same marketing services will be reduced as a result of many of these developments, but the services may be increased to the extent that marketing costs as a whole may be much higher--that is, if the processors do part of the housewife's work, she will have to pay for it in higher costs.

Farmers will be variously affected, depending on their geographic location and competitive position. Greater emphasis will be put upon efficiency in production, and those growers so situated that they can produce high-quality products at relatively low cost per unit have everything to gain from improvements in marketing. The growers who stand to lose the most are the ones whose products sold because housewives had no other choice. Those producers will be forced to look to greater efficiency and higher quality in order to maintain their competitive position.

Marketing agencies will be affected most of all. Established enterprises that try to rest on laurels won under different conditions will be among the first to lose their business to enterprises that have had the imagination to adopt the new methods. Periods of rapid technological change offer opportunities for enterprises smart enough to take advantage of the changes.

Storing Grain in Small Bins

By E. R. Gross and H. H. Walkden

Grain can be stored almost indefinitely with little deterioration in farm-type bins--those that hold 1,000 to 3,000 bushels--if it is kept dry, cool, clean, and free of insects.

When the Government acquired large surpluses of grain under the Agricultural Adjustment Act, the State agricultural experiment stations of Illinois, Iowa, Kansas, and North Dakota and several units of the U. S. Department of Agriculture started cooperative investigations to determine the best ways to store grain in farm-type bins. The investigators had problems, particularly with shelled corn, that had never before arisen. But as a result of their efforts many millions of bushels of wheat and shelled corn were stored several years with a loss of less than 1 percent that could be attributed to deterioration while in storage.

Keep It Dry

One of the first things they learned was the importance of having the grain dry. The maximums in moisture content considered safe for the long-time storage of shelled corn and wheat are: Shelled corn, 13 percent; hard red spring wheat, 13 percent; soft red winter wheat, 12.5 percent; hard red winter wheat, 12 percent.

Lower average grain temperatures can be maintained by painting steel bins white or by shading them. Grain in wooden bins is less subject to extremely high temperatures at the walls. Temperatures of 135° F. were observed at the walls in unpainted steel bins at Hutchinson, Kans.

Dry, cool, clean grain discourages the development of insects. For the control of insect infestation, chief reliance must be placed on fumigation. Grain dust and broken kernels contribute to a favorable environment for insect development and make fumigation harder. Grain that contains large amounts of foreign material, such as weed seeds, husks, and stems, may deteriorate because of the higher moisture content of such materials.

The research men made many observations on the condition of grain stored in steel bins during the storage period and when the bins were emptied. The most serious damage to the grain was caused by water leaks at bolts joining wall and roof sheets, door jambs, ventilators, and such. Because of low foundations and poor drainage, some bin floors were submerged. If the floor or foundation extends laterally beyond the bin wall, drainage from the walls will be intercepted and is likely to enter and cause decay. Inadequate foundations led to settling so there was distortion of the bin and straining of the joints. In the northern sections wind-driven snow came through the cracks that resulted. Bins must have sufficient strength in foundations, floors, and walls to re-

sist the pressure of the weight of the grain.

Making the bins leak-proof is largely the responsibility of the manufacturer, but farmers must consider the point when they buy and erect the bin. All joints between roof sections, wall sheets, and framing for openings require careful caulking at the time of construction. Bins already built can be improved by caulking. Bolts must be equipped with leak-proof lead washers applied under the head and drawn to uniform tension.

The floor should be elevated enough above normal grade so that water cannot collect at the floor-wall junction. Water from melting snow banked against the bin wall may enter at this point. Careful caulking there will minimize the hazard. Wall sheets must extend below the floor level to avoid a water table that will collect drainage from the walls.

Wooden Bins

Wooden bins provide good storage if they are kept tight. Single-wall bins are seldom tight enough to exclude moisture or retain fumigants satisfactorily. Bins that are not tight can be lined with heavy, reinforced, waterproofed paper, which must usually be replaced or repaired for each filling of the bin. Double-wall bins have proved to be superior to single-wall bins over a period of years because they keep out moisture and retain fumigants better. During the investigations, many other materials were tested and were found to be satisfactory if they met the requirements of structural strength, durability, and exclusion of dampness.

Drying in steel bins with perforated walls or floors or both and wind cowls of either the pressure or suction type was satisfactory. But wall perforations admitted moisture during driving rains, and the grain at the walls spoiled. The successful use of perforated walls is limited to the drier high Plains region.

Wood, steel, and concrete are commonly used for permanent grain-bin floors. Recent tests of these materials in 18 types of construction showed that 3 general types are satisfactory: Any floor supported on joists with free circulation of air beneath; steel floors on a fill of either earth or gravel to raise the floor above the surrounding grade and provide drainage away from the bin; concrete floors when equipped with a positive moisture and vapor barrier.

Insects attacking stored grain are not active at temperatures below 40° F., and multiply rapidly only at temperatures above 70° F. Insects are not a serious factor in the northern part of the grain-growing region, because temperatures of the grain do not rise high enough during the summer to permit the rapid development of infestations. The higher average temperatures south of the forty-first parallel favor rapid development, and insect infestation becomes a major hazard.

In southern Kansas, 22 management practices were evaluated with respect to their effect on wheat and their efficiency in preventing damage

from insect attack. With the exception of the untreated check bins, all the practices maintained the original commercial grade until the bins were emptied. Three were found to be satisfactory in controlling insect infestation: Fumigating twice annually, in August and October; fumigating annually in September; turning, cleaning, and fumigating annually in September. Steel bins with white walls and roofs maintained average grain temperatures about 6° F. lower than unpainted bins. The lower temperatures prevented the development of damaging insect infestation during the first 3 years but failed in the fourth.

For long-time storage the practice of fumigating in August and October and that of turning, cleaning, and fumigating in September were equally effective, but the added cost of turning and cleaning is not usually warranted. Fumigating in September has the advantage of reducing fumigation expense, but the rapid development of insects in August and early September just before fumigating causes unnecessary damage to the grain and leaves it more susceptible to subsequent infestation.

Kinds of Insect Damage

Besides eating the grain, insects cause other damage. In the fall, moisture accumulates in the cooled grain on the surface as a result of the normal upward movement of air from the warmer grain below. Insects create both moisture and heat, and they cause hot spots when they are concentrated in large groups. Severe infestation accelerates the upward movement of moisture and causes crusted and moldy grain at the surface so that all grain may be contaminated when the bin is emptied.

Fumigation offers the best method of controlling insects attacking grain stored in farm-type bins. It is advisable to inspect stored wheat once a month during periods when the temperature of the wheat reaches or exceeds 70° F., and to fumigate it if found to contain one or more weevils or lesser grain borers, or 15 or more bran beetles per quart.

By fumigating in August and again late in September or October, insect infestation will be destroyed. The wheat will cool normally in the fall and winter, and will usually remain in good condition until midsummer.

Inspection after severe storms is desirable. If leaks have developed wet grain should be removed, because migrating insects are attracted to high-moisture grain.

Shelled corn placed in long-time storage should be clean (that is, with less than 0.5 percent of cracked corn and foreign material). It is advisable to spray the surface grain with oil at the rate of 2 quarts to 1,000 bushels--an excellent preventive against insects that are likely to enter the bin during the summer. The oil should be a refined mineral oil of 100-200 seconds viscosity (Saybolt, 100° F.) and be free from objectionable odor. Corn should be inspected with the same frequency as recommended for wheat and fumigated when found to be infested at the rate of 1 weevil or 25 bran beetles per quart.

Cotton Ginning

By Charles A. Bennett

The processes that are broadly termed ginning in the cotton industry have undergone many changes and advances since 1935, in keeping pace with farm production. The number of active gins has declined from approximately 13,000 in 1935 to 8,257 in 1946, but the ginning volume of each gin has increased and features have been added that sharply distinguish the modernized gins from the old.

Mechanization a Reality

Although mechanization in cotton production was in sight in 1935, it is now a reality. It has forced improvements and advances upon the ginning industry without which the cotton producer could not continue. Among the improvements are all-metal buildings and machinery, standardized interchangeable parts, and machine production on dimensioned jigs under closer tolerances of finish and fit. These have replaced wooden construction and rough castings. Cotton driers, gin stands of greater capacity, better pneumatic apparatus, and greater accessibility are pronounced improvements.

Cotton drying processes, fostered and developed by the U. S. Department of Agriculture since 1929, have spread to more than a third of all of the active cotton gins--a third that handles at least 65 percent of all the cotton. Research in drying cotton has been extended to the application of a series of drying stages in succeeding machines, and the art of cleaning seed cotton has been furthered by many new designs.

Bulk extracting of heavier foreign materials from the harvested cottons gave way to the highly specialized development of unit extracting and feeding processes over each cotton gin stand. The result has been a resurgent improvement of the large master extractors to a position of primary importance in the mechanized production of cotton. Outstanding examples are the several types of cleaning and extracting machines that have angular bar grids, revolving knuckle-tooth disk grids, reciprocating cleaner cylinders in staggered vertical decension, and other ingenious devices for removing foreign matter gathered by machine harvesting. Two other research studies have been started: One seeks to find a way to restore necessary moisture to very dry fiber during ginning, and the other to clean even better the ginned fiber as it passes from gin stands to the bale press.

The vigorous adoption of single-variety cotton planting by farsighted communities has effected a further advance in ginning processes for protecting purity of ginned cottonseed, cleaners and graders for the seed, and better methods of testing germination and prospective betterments in yield and fiber quality. The trend toward single-variety cotton communities has been sound and healthy, and should lead to visual bale identification in coverings and tags to assure consumers that they are receiving a specialized variety of cotton fiber from dependable producers.

The desirability of having definite supplies of quality cotton of preferred variety induces the spinner and processor of fibers to obtain such cottons direct from the producer. Here the greatest opportunity may exist for standard-density cotton gin presses, which are foreseen in the findings by the research engineers and technologists that cotton bales of standard density (22 to 25 pounds per cubic foot needed for domestic shipment at favorable rates) as compared to low-density, bulky, gin bales (11 to 15 pounds per cubic foot) can be readily produced at the larger volume cotton gins in a mechanically practicable and economically feasible manner.

The size of the 500-pound square bale of standard density from a cotton gin press is approximately 22 inches wide, 30 inches high, and 56 inches long. It has eight ties, preferably held by heavy-duty steel rod buckles, and the cotton gin machinery ahead of the press needs no change from its present forms and dimensions.

The gin standard density presses now in use are of both down and up packing type, but new designs utilize either two or three rams, although three 9 1/2 inch rams have heretofore appeared to be somewhat preferable.

Natural Resilience Not Killed

These presses do not kill the natural resilience of the cotton fibers, and the bales consequently open quickly at the spinning mills during the first blending processes that are otherwise delayed by the extreme crushing encountered when low-density bales undergo commercial compression between the gins and mills. The gin standard-density bales are pleasing in appearance, well protected, compact, and economical of floor space in the opening and picking processes at the mills.

Bale fires have not been experienced in any instance within standard-density gin bales, although fires during ginning processes have occurred at the gins where these presses have been installed.

A standard-density gin bale is also suitable for high-density recompression, because it fits between the side doors of the high-density presses. The layering of the bale contents is therefore not disturbed by the high-density pressing.

It is estimated that the ginning volume of 5,000 or more bales a year at large cotton gins would enable the operators to produce standard-density gin bales for 7 cents each more than it costs to produce low-density or flat bales, and that in small volume gins of 1,000 bales capacity a season the increased cost would reach 27 cents a bale.

There are certain lumitations, of course, in most industrial methods, and the immediate possibilities for beneficial use of standard-density gin presses appear to reside in the availability of single-variety cottons direct to the mills from large individual or cooperative producers. On a 1,000-bale volume basis, the single-stage compression of standard-density gin bales may save 43 cents per bale for the industry, while a 5,000-bale volume production at the gin could save up to 63 cents a bale.

Citrus at Its Best

By Paul L. Harding

Oranges and grapefruit have become tremendously important in the diets of Americans. One fact as proof, if proof were needed, is that between 1933 and 1947 our production of oranges increased from 47 million boxes to 108 million and of grapefruit from 14 million boxes to 62 million. Almost as obvious as the fact that we eat a lot of citrus fruits is the fact that they are bound to vary in quality. Let us examine, as a subject worth the attention of everyone who eats or grows oranges and grapefruit, what makes them good--specifically, the relation of maturity to quality in citrus fruits.

In the early years of citrus growing in the United States the decision as to the proper time for picking the fruit was made largely by the individual grower. The increase in production resulted in more businesslike methods of handling the crop, so that eventually the industry cooperated in having State laws passed to effect more orderly marketing. Minimum standards were based on a break in the color of the rind, volume of juice, and the content of soluble solids and citric acid in the fruit, and the ratio between them.

In 1935, the U. S. Department of Agriculture began a comprehensive study of the factors that affect the quality of the juice of Florida oranges. Then it made similiar studies of Florida grapefruit, tangerines, and Temple oranges. The results are applicable, in the strict sense, only to Florida fruit, but probably apply generally to the same varieties grown elsewhere, although the extent to which they may thus apply in other States has not been determined. The investigations have included observations and measurements of physical characteristics and analyses of the chemical constituents of the principal varieties at definite intervals, beginning with immature fruit and continuing until it had become fully mature and ripe.

Maturity and Ripening

Maturity refers to a stage of development of a fruit; ripening refers to the process by which a mature fruit becomes edible when held under suitable conditions. A mature fruit has attained the degree of development in which it will ripen with acceptable eating quality. Fruits with starchy reserves, like apples and pears, may be mature at harvesttime, although many late varieties do not become ripe until sometime later, when they attain fully their soft, juicy, aromatic qualities. In contrast, oranges and grapefruit owe their sweetness to natural sugars occurring as such. They contain practically no starch, and do not undergo such a marked change in composition as apples and pears after being picked.

Since the ripening processes occur only while the fruits are on the tree, it can readily be understood that they should not be harvested until they are mature and therefore ripe. Instead of increasing in

palatability after harvest, these fruits tend to lose quality, the rate of this loss depending on the temperature at which they are held. The higher the temperature, the more rapid the deterioration.

Quality Factors

Quality often is associated with appearance, firmness, freedom from blemishes, and thickness and texture of rind, but actually it is determined by the texture of the flesh, juiciness, content of total solids (principally sugars), total acid, ratio of total solids to acid, aromatic constituents, and vitamin and mineral content. The age of the fruit is also important, because immature fruit is usually very acid or tart, whereas overripe fruit held on the tree too long may become insipid or develop off-flavors.

There are, of course, no hard and fast lines of demarcation between the successive stages through which fruit passes from the time it is first formed until it completes its growth and development. As fruit develops from an immature stage to full maturity, it becomes more and more pleasant to the taste until it reaches perfection for any given variety. Thus the greatest amounts of sugars are found in fruits that are left on the trees until they reach maturity. Conversely, fruits picked before they have become mature neither contain their potential maximum of sugars nor develop any more sugars after picking. While sugars increase, acidity decreases as the fruits become more mature, and the most desirable eating quality is reached when there is such a balanced blending between the total solids (principally sugars) and the total acid (citric) as to make the fruit most palatable.

Because most consumers probably consider sweetness the most essential characteristic in oranges, the desired condition of balanced blending may be said to occur, for all practical purposes, when the fruit contains its maximum potential sugar content. The term "tree-ripened fruit" is often used. It means simply that the fruit has remained on the tree until it is ripe enough to be relished or has attained its potential maximum content of sugars. Any inference from the use of this term that the fruit can be ripened after harvest, even to a negligible degree, is incorrect. The color of the skin can be altered by artificial means; therefore, the color of the skin may have no bearing on its stage of maturity or ripeness. A wholly green fruit may be fully ripe under certain natural conditions, and a fully yellowed fruit may be immature under other conditions. It is the composition of the fruit and not its color that determines whether or not it is ripe. It is as ripe as it ever will be, when it is picked.

It is extremely important, therefore, to delay picking until the fruit reaches a desirable stage of maturity if it is to satisfy consumers. It is correspondingly important also to base standards for judging maturity on criteria adequate for the purpose.

When oranges and grapefruit are still immature, the rind and flesh have a greenish color; the juice vesicles appear like grains of rice and are not distended with juice as in the mature fruit. The walls of these

juice cells are thick and conspicuous, the juice itself is greenish-yellow to yellow, lacks aroma, is acid to very tart, and has a raw, immature taste. As development progresses and the fruit matures, the greenish color in the rinds disappears and, in oranges, the fruit takes on its characteristic aroma and orange color, or, in the case of grapefruit, a tannish-yellow color. Progressive changes also occur within the fruit, the vesicle cell walls becoming thinner and the vesicles distended with juice.

The size and weight of fruit usually increase, but the greatest rate of increase is during the period of development before maturity. The volume of juice increases until the fruit is ripe. Then it remains rather constant until the fruit starts to dry out. When this happens the fruit loses somewhat in volume as well as in flavor.

More than 13,000 individual fruits were analyzed to determine how size affects the volume of juice, total solids, and total acid at different times before and during the harvesting period for the principal varieties of Florida oranges. It was found that as the fruit ripens there is an increase in volume of juice and total solids and a decrease in acidity regardless of the size of the fruit. The smaller fruits contained more solids and acid, and, on the basis of the standard packed box (1 3/5 bushels), a greater volume of juice. Thus the packs of smaller sizes weigh the most.

Vitamin C

Because of the importance of the vitamin content of oranges and grapefruit in determining their dietetic value, data regarding the ascorbic acid (vitamin C) content of the juice of exposed and shaded oranges are especially interesting. Fruits grown on the outside of the tree and well exposed to sunshine contain from 14 to 48 percent more ascorbic acid than those grown on the shaded inside branches. From outside to inside fruits, the concentration of ascorbic acid, when calculated as milligrams per milliliter of juice, gradually becomes less.

The concentration of ascorbic acid in the juice goes down as the fruit matures, but the total content per fruit remains about the same, the vitamin being dispersed in the increased amount of juice found in the more mature fruit. As the fruit becomes overmature and begins to dry out, its ascorbic acid content diminishes.

Orange and grapefruit trees grown on rough-lemon rootstock usually become larger and come into bearing earlier, and consequently produce larger crops than those grown on sour-orange rootstock. Also, on rough-lemon rootstock the fruits average slightly larger and have a little coarser texture and thicker rinds, but contain somewhat less juice on the basis of weight. Eating quality is not quite so high as that of fruits grown on sour-orange rootstock. The latter usually contain slightly higher amounts of total solids and total acid than those grown on rough lemon.

Since the "big freeze" of 1894-95 in Florida, most of the varieties

of oranges have been budded or grafted on rootstocks particularly adapted to the soil of the locality. But there are still in Florida many old groves of seedling orange trees on their own roots, which were grown from the seeds of the sweet orange. The fruits from these are commonly referred to as Seedlings.

Generally the kind of rootstock used is the one best adapted to the type of the soil. Certain rootstocks are better suited to light sandy soils, others to heavier soils. For example, rough lemon is a very thrifty grower, has an extensive root system, and is used most frequently in soils in which the organic matter is low and the land is rolling. Sour-orange rootstock is used mostly in level soils having more than the average amount of organic matter.

Florida Varieties

More varieties are grown commercially in Florida than in any other citrus section. The harvest season normally extends from about October to June. Several varieties of oranges, Parson Brown, Hamlin, Conner, and so on, make up the bulk of the early crop; Seedlings, Pineapple, Jaffa, and Homosassa compose the midseason crop harvested in December, January, and February, and Valencia and Lue Gim Gong constitute the bulk of the late crop.

The varieties differ in quality, but the mature fruits--in their prime eating condition--are good generally in practically all the commercial varieties. Consumers often find that midseason oranges are better than the early oranges, and assume that it is because the same early oranges have been left on the tree longer.

This is only partly true. The oranges marketed in midseason are generally of different varieties. Since they follow the early varieties instead of arriving at a market bare of Florida citrus, they are generally permitted to remain on the tree until maturity before harvesting. Thus they are more likely to attain excellent quality than the early varieties.

Some of the varieties that are recognized as having better-than-average quality are Seedlings, Pineapple, Temple, and Valencia. Among these the Temple is unique in containing aromatic qualities that give the juice a desirable bouquet and flavor.

Of the two leading grapefruit varieties, the Duncan rates slightly superior to the Marsh. The differences are not great, however, and the Marsh is more popular because it is practically seedless and is easier to prepare for eating.

Other factors that affect quality include kinds and amounts of fertilizers, drought, drainage, irrigation, insects, pests, diseases, and freezes, which affect the vigor and physiology of both trees and fruit.

Commercial fertilizers are used in large quantities in Florida, principally because much of the grove land is a light sandy soil compar-

atively low in natural fertility and readily leached by rains. Under proper care and management, the trees consistently yield large crops and much work has been done to improve tree vigor and fruit quality. Noteworthy research has paved the way toward correcting deficiency diseases by supplementing the common fertilizers with minor elements.

A. F. Camp, of the Citrus Experiment Station, Lake Alfred, Fla., and others have investigated the symptoms of citrus malnutrition and have demonstrated that mineral deficiencies can readily be corrected by the use of proper fertilizers. The use of copper, zinc, manganese, magnesium, and to a lesser extent iron is now an integral part of commercial practice, and helps to improve the quality of the fruit.

If a drought occurs in early spring, blooming may be delayed until rains finally come. Droughts later in the season cause smaller fruits. In severe droughts so much moisture is withdrawn from the fruits as to make them soft. On the other hand, too much water in the soil may cause fruit to split.

In the final analysis, the taste of the consumer determines the demand for citrus fruits. The more vitamins and juice the fruit contains, provided there is a proper blend of sugars and acid, the more valuable it is. Harvesting at the proper time and use of adequate standards of maturity will help to win approval by placing the fruit on the market when it is most palatable and has the highest nutritional value. That is, the fruits must be left on the trees long enough to mature properly.

* *
*

NEW-TYPE REFRIGERATOR CAR WILL GO INTO COAST-TO-COAST SERVICE

Operators of a private refrigerator car line plan to inaugurate a coast-to-coast service this spring using the new-type iceless refrigerator cars recently tested by the U. S. Department of Agriculture.

Designed to keep frozen foods at temperatures below zero, the cars will be equipped with a split absorption type of refrigeration system that requires no power, has no moving parts, and uses anhydrous ammonia as a refrigerant. The car-line organization will establish ammonia service stations for refueling the cars en route.

Refrigerator cars capable of holding frozen foods at below-zero temperatures are greatly needed to distribute frozen foods properly. The lowest temperatures now maintained in conventional refrigerator cars--12° to 20° above zero--are developed with ice and salt.

In a laboratory test of an experimental model of the split-absorbtion refrigerator car last year, the Department determined that even under conditions of extreme summer heat the car held a load of frozen fruit at temperatures averaging below zero.

MARKETING BRIEFS:

Cotton.--The cotton sales for export program was amended on February 11 to exclude export payments on cotton paid for with funds provided under the Foreign Aid Act of 1947.

Dairy Products.--At the request of dairymen supplying the Columbus, Ohio, milk marketing area, a public hearing will be held at Columbus on February 25 to consider producer and handler proposals for an increase in class price differentials. Present differentials for milk used in Classes I, II, and III would be increased, under producers' proposals, by 25 cents per hundredweight for milk of 3.5 percent butterfat content.

Fats and Oils.--The remainder of fats and oils to be purchased by the Commodity Credit Corporation against fourth-quarter allocations for CCC procurement was 8.2 million pounds on February 17.

Fruits.--Mid-February amendments to the California-Arizona lemon marketing agreement and order program established two districts for regulation purposes and provided for the regulation of certain marketings of lemons within the two States. Previously such regulations applied only to lemons shipped in interstate commerce.... 2,4-D may supplant naphthaleneacetic acid as a pre-harvest spray to retard fruit drop in Bartlett pears. This is indicated in a recent USDA study in the Pacific Northwest. In a 3-year comparison a weak solution of 2,4-D proved as effective as the standard sprays of naphthaleneacetic acid now used; and the 2,4-D is less expensive.

Grain.--Exports in January of U. S. grain and grain products amounted to 1,159,000 long tons (44,408,000 bushels), USDA estimates. This raised the total for the 7 months July through January to 9,649,000 long tons, compared with 6,379,000 long tons during the same period a year earlier. ... Secretary of Agriculture Anderson has proposed a tentative voluntary industry agreement for the brewing industry, with the purpose of conserving essential food and feed grains. The suggested agreement provides that (1) no brewer will use wheat or table-grade rice; (2) the use of malt barley by individual brewers shall not exceed by more than 5 percent the quantity used during the comparable month of 1947; (3) the use of all other grains by individual brewers will be reduced 15 percent below that in the comparable month of 1947; and (4) each brewer will be authorized to use a minimum of 120,000 pounds monthly, with exceptions for hardship cases. The agreement would run through June 30, 1948, and could be extended by the Secretary through February 28, 1949.

Nuts.--USDA will offer to buy, on a bid basis, approximately 2,000,000 pounds of surplus shelled walnuts and approximately 450,000 pounds of surplus shelled filberts for use in the school lunch program.

Tobacco.--On February 17, USDA announced that it was reviewing the supply and demand outlook for burley tobacco in order to determine whether the 1948 national marketing quota of 474,000,000 pounds announced on November 28 should be increased and, if so, by how much.

ABOUT MARKETING:

The following addresses, statements, and publications, issued recently, may be obtained upon request. To order, check on this page the items desired, detach and mail to the Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.

Addresses and Statements:

Taking Stock of the World Food and Market Situation, by Clinton P. Anderson, Secretary of Agriculture, at Washington, D. C. February 18, 1948. 11 pp. (Mimeographed)

Agricultural Engineering Responsibilities and Opportunities Under the Research and Marketing Act, prepared for delivery by E. A. Meyer, administrator of the Research and Marketing Act, at Washington, D. C. February 13, 1948. 10 pp. (Mineographed)

The Fats and Oils Situation, by George L. Pritchard, director of the Fats and Oils Branch, PMA, at New York, N. Y. January 27, 1948. 10 pp. (Mineographed)

Testimony of Charles F. Brannan, Assistant Secretary of Agriculture, before the Congressional Joint Committee on the Economic Report. February 5, 1948. 16 pp. (Mimeographed)

Statement on farm machinery supplies by Frederic B. Northrup, director of the Price Support and Foreign Supply Branch, PMA, before the House Agriculture Committee. February 10, 1948. 7 pp. (Mimeographed)

Publications:

Annual Report on Tobacco Statistics, 1947. (PMA) November 1947. CS-25. November 1947. 112 pp. (Multilithed)

The Market News Service on Fruits and Vegetables--Its History and Operation. (PMA) January 1948. 7 pp. (Multilithed)

Oil Crops in American Farming. (Bureau of Agricultural Economics) Technical Bulletin 940. November 1947. 55 pp. (Printed)

Flaxseed in American Farming. (Bureau of Agricultural Economics) Technical Bulletin 938. November 1947. 62 pp. (Printed)

Animal Units of Livestock Fed Annually, 1919-20 to 1946-47. (Bureau of Agricultural Economics) F.M. 64. November 1947. 23 pp. (Multilithed)

Costs of Canning Selected Vegetables, Northeastern States, 1941. (Bureau of Agricultural Economics) December 1947. 21 pp. (Mimeographed)

Rations Fed to Milk Cows, 1946-47. (Bureau of Agricultural Economics) January 1948. 28 pp. (Mimeographed)